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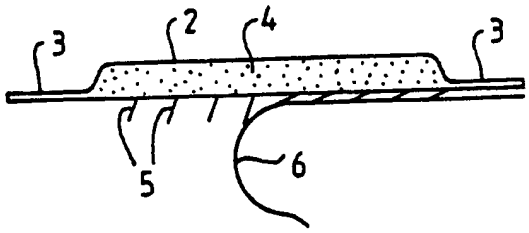
(54) An injection device

(57) In a device by which the liquid (4) contained within the sachet (2) can be transferred into the subcutaneous layer of the skin of the patient with reduced stress to the patient over a conventional syringe the transfer is via a number of hollow filaments (5), protected and kept sterile until used by a membrane (6), which pierce the skin. When pressure is applied to the external surface of the sachet (2) the liquid is expressed into the subcutaneous tissue. The sachet is flexible so that after removing from the skin it can be folded down around the filaments to protect the user.

Fig.3



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy

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Fig.1

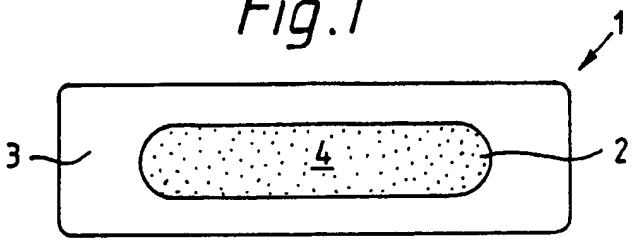


Fig.2

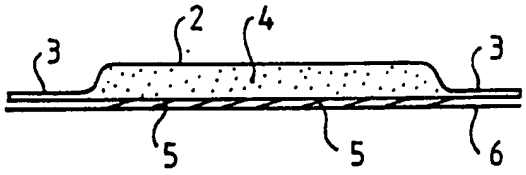


Fig.3

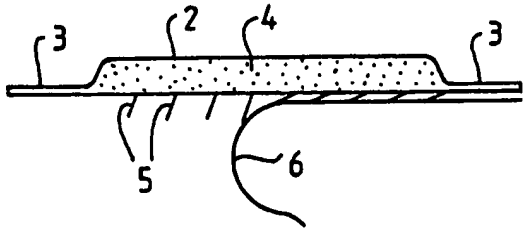


Fig.4

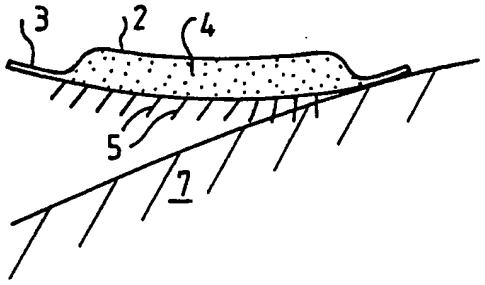
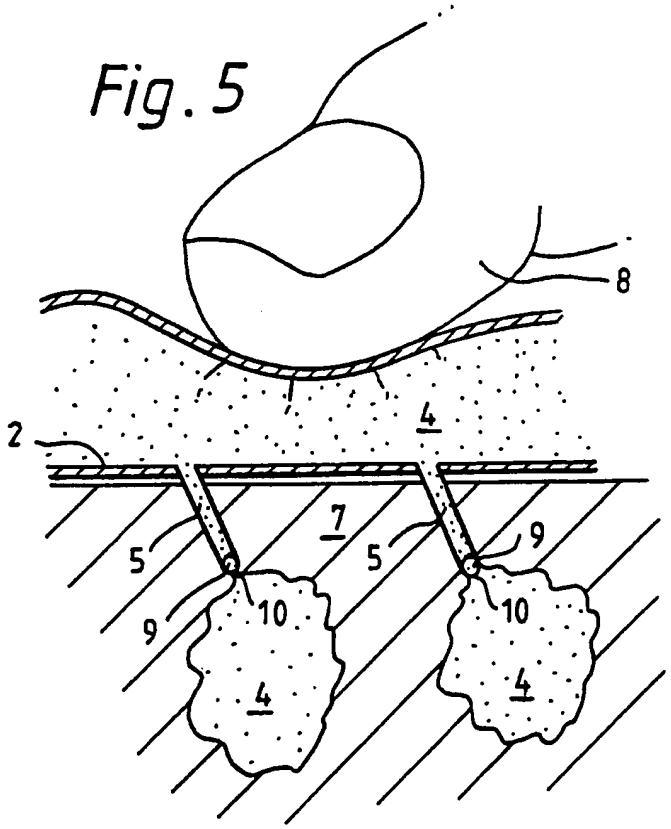


Fig.5



EILERT EILERTSEN 30/2713/01

An Injection Device

The invention relates to devices for injecting liquids below the surface of the skin of a subject, and in particular where the liquid is to be injected into the subcutaneous layer of the skin.

Conventional injection devices comprise a syringe which holds the liquid to be injected and a hollow needle attached to the end of the syringe which is inserted into the subcutaneous layer of the skin. The liquid is then expressed from the syringe, through the needle and into the subcutaneous layer. This conventional device has a number of significant disadvantages, for example very sharp needles are required which may injure a person by accident or if the needles are misused, the subject into which the liquid is to be injected may be psychologically frightened by the needle, it requires skilled personnel to administer the injection, and can be painful to the subject if administered incorrectly.

In accordance with the present invention I provide an injection device for injecting a liquid into a subject, the device comprising a support to which a number of hollow filaments are attached, the filaments communicating in use with a reservoir designed to hold the liquid, wherein the hollow filaments are adapted to puncture the surface of the skin of the subject when the support is pressed onto the skin so that the liquid may be transferred from the reservoir through the hollow filaments to beneath the surface of the skin.

By using a number of thin hollow filaments to puncture the skin and to pass the liquid into the skin it is possible to avoid the disadvantages of the conventional needle and syringe by having filaments with

a sufficiently small diameter, which cause substantially no pain during the administration of the injection. Typically, the diameter of the filaments would be between 0.1mm and 0.3mm.

In the preferred embodiment, the reservoir is formed on one side of the support and is flexible. The hollow filaments are formed on the other side of the support. Typically, the liquid is transferred from the reservoir through the hollow filaments to beneath the surface of the skin by pressure applied to the reservoir. Typically, the pressure would be applied by a finger of the person administrating the injection.

Preferably, the reservoir and the hollow filaments would be in the form of an adhesive pad which would be placed on the surface of the skin. Typically, a protective layer would cover the surface of the reservoir having the hollow filaments and would be removed immediately before the device was to be applied to the skin. The protective layer would prevent damage to the hollow filaments and would also keep the device sterile.

In the preferred embodiment the hollow filaments would have a sufficiently small diameter to prevent leakage of the liquid from the filaments prior to administrating the injection. Typically, apertures in the hollow filaments express the liquid transversely to the axis of the filaments into the skin.

Preferably, the device would fold after use so that the filaments would not be exposed and accidental injury to a person administrating the injection could be avoided.

An example of an injection device in accordance with the invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a plan of the device;

Figure 2 is a cross-sectional view of the device with the protective layer still attached;

Figure 3 is a cross-sectional view of the device with the protective layer partially removed;

Figure 4 is a cross-sectional view of the device as it is applied to an area of skin; and,

Figure 5 is an enlarged cross-sectional view of the device in use.

Figure 1 shows a pad 1 comprising a sachet 2 formed of a plastic material which is supported by a supporting layer 3. In this example the sachet 2 contains a local anaesthetic 4. However, the sachet 2 could contain any other suitable liquid which is to be injected into a subject, such as a steroid.

As can be seen in Figure 2 an array of hollow filaments 5 extend downwards at an angle from the lower surface of the sachet 2 which contains the local anaesthetic 4. The hollow filaments 5 are protected by a protective layer 6 which also keeps the hollow filaments 5 sterile. Immediately before the injection is to be administered the protective layer 6 is removed from the lower surface of the support layer 3 and the hollow filaments 5, as shown in Figure 3. The removal of the protective layer 6 allows the hollow filaments 5 to unfold from the storage position, in which they are held against their own resilience, so that they extend vertically downwards from the sachet 2 as seen in Figure 3.

After removal of the protective layer 6 the pad 1 is handled only at the edges of the supporting layer 3 to prevent contamination of the hollow filaments 5. The pad 1 is then applied to the area of the skin 7 of a subject which is to be anaesthetised by placing the pad 1 on the surface of the skin, as shown in Figure 4, so that the hollow filaments 5 puncture the skin 7. The diameter of

the hollow filaments 5 is sufficiently small so that no pain is felt by the subject when the hollow filaments 5 puncture the skin or any other area of tissue to be injected. Typically, the diamter of the filaments 5 is between 0.1mm and 0.3mm and they could be fabricated from a ceramic material, such as glass fibre or they could even be fabricated from steel.

As can be seen in Figure 5, the hollow filaments 5 are connected to the sachet 2 so that the local anaesthetic 4 may pass from the sachet into the hollow filaments 5. When pressure is applied to the sachet 2 by, for example, a finger 8 of a person administrating the injection, the local anaesthetic 4 passes through the hollow filaments 5 and is expressed out of the apertures 9 in the hollow filaments 5 and into the surrounding layer of the skin 7. The local anaesthetic 4 then diffuses amongst the layer of skin 7 into which it has been injected and anaesthetises that area.

Typically, the apertures 9 in the hollow filaments 5 would be formed by an oblique cut through each hollow filament, and the oblique cut would also form a point 10 on each filament 5. However, it would be possible to form the apertures 9 separately from the points 10 of the filaments.

After the local anaesthetic 4 has been expressed from the sachet 2 into the skin 7 the pad 1 is removed from the surface of the skin. This withdraws the hollow filaments 5 from the skin and the pad 1 is disposed of.

In order to prevent accidental operator injury the pad 1 could be constructed so that after its removal pad 1 from the area where the injection has been administered, it folds upon itself so that none of the hollow filaments 5 are exposed. This type of construction would prevent, for example, the person administrating the injection accidently puncturing

himself with the hollow filaments and injecting himself with any residual local anaesthetic 4 or any other liquid which is still within the sachet 2.

CLAIMS

1. An injection device for injecting a liquid into a subject, the device comprising a support to which a number of hollow filaments are attached, the filaments communicating in use with a reservoir designed to hold the liquid, wherein the hollow filaments are adapted to puncture the surface of the skin of the subject when the support is pressed onto the skin so that the liquid may be transferred from the reservoir through the hollow filaments to beneath the surface of the skin.

2. An injection device according to claim 1, wherein the support forms a wall of the reservoir.

3. An injection device according to claim 1 or claim 2, wherein the liquid is transferred from the reservoir through the hollow filaments to beneath the surface of the skin by pressure applied to the reservoir.

4. An injection device according to claim 3, wherein the pressure is applied by a finger of an operator.

5. An injection device according to any of the preceding claims, wherein the support is in the form of an adhesive pad.

6. An injection device according to any of the preceding claims, wherein the diameter of the hollow filaments is sufficiently small to prevent leakage of the liquid from the hollow filaments before the support is pressed onto the skin.

7. An injection device according to any of the preceding claims, wherein the hollow filaments are resilient.

8. An injection device according to any of the preceding claims, further comprising a protective layer which covers the hollow filaments and is detached prior to use of the device.

9. An injection device according to any of the preceding claims, wherein the device is adapted to fold after use so that the filaments are not substantially exposed.

10. An injection device according to any of the preceding claims, wherein the hollow filaments are sterile.

11. An injection device as hereinbefore described with reference to the accompanying drawings.